INSTRUCTION MANUAL

FOR

LABORATORY CENTRIFUGE

Z 320

NATIONAL LABNET COMPANY

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WOODBRIDGE, NJ 07095

(201) 283-4555

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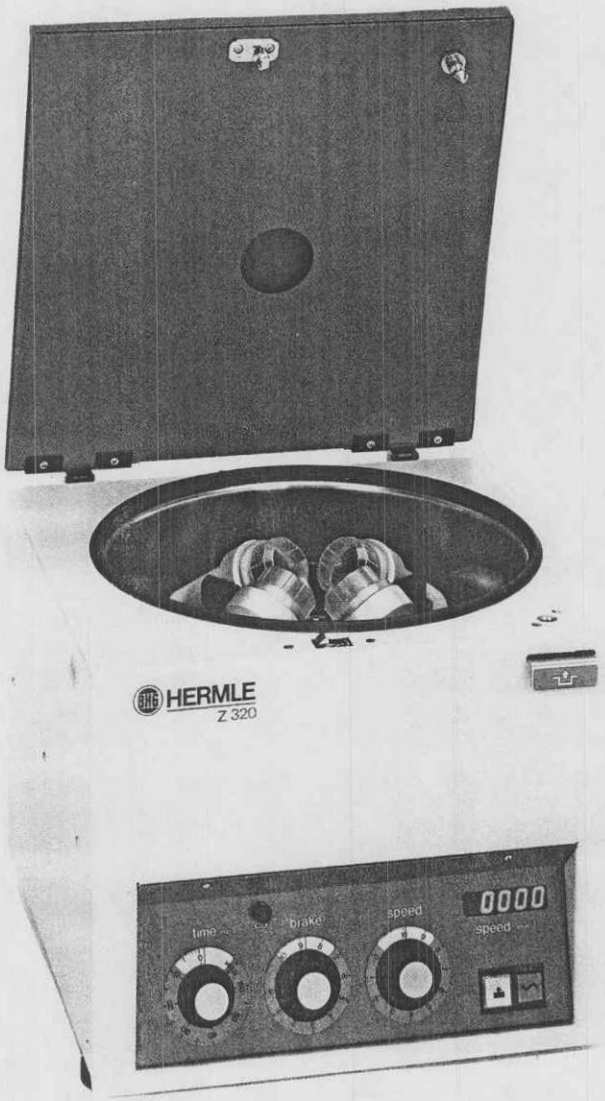
INTRODUCTION

Getting To Know Your New Z320 Centrifuge
(see illustration on page 1B)

The Hermle model Z320 is a laboratory benchtop centrifuge designed for medium throughput in research, clinical and industrial laboratories. Up to 24 15ml tubes can be simultaneously centrifuged at speeds ranging up to 3300 RPM. With optional rotors and accessories, the Z320 can accommodate a maximum capacity of 400ml or a maximum speed of 9000 RPM.

The Z320 may be used to achieve separations in a variety of different test tube sizes and a variety of biological samples including blood and urine.

The main operating control is the timer which basically serves as an ON/OFF switch. Each Z320 incorporates a number of safety features including an electronic and mechanical lid lock, heavy gauge stainless steel rotor chamber, and an all steel lid and housing. NO ATTEMPT SHOULD BE MADE TO OVERRIDE ANY SAFETY FEATURE.



FEATURES OF THE Z320 CENTRIFUGE

1 - TIME SELECTOR
2 - FUSE
3 - BRAKE SELECTOR
4 - SPEED SELECTOR
5 - LID INDICATOR/SWITCH
6 - MAIN POWER SWITCH
7 - DIGITAL SPEED INDICATOR
8 - MECHANICAL LID RELEASE

Figure 18

1. General Information

1.1 Description

Model" Z 320" is a universal bench top centrifuge which covers many fields of application by offering a wide range of accessories. It accomodates swing out rotors up to a max. capacity of 4 x 100 ml, as well as angle rotors up to 10.000 rpm (microtiter rotor and hematocrit rotor see brochure).

1.2 Safety precautions to be observed before operating the centrifuge

Do not operate if:

- the centrifuge has not been installed correctly
- the centrifuge is partly dismantled
- service has been attempted by non-authorized or non-qualified personnel
- the rotor has not been installed securely on the motor shaft

Do not operate the centrifuge with rotors and accessories not belonging to the standard range of accessories of this centrifuge without obtaining the prior permission of the manufacturer. Exception: tubes and bottles made of glass or plastic normally available in the laboratory.

Do not operate the centrifuge in explosive atmospheres.

1.3 Safety standards

The centrifuge corresponds to the general requirements set by German law for medical apparatus, "Med GV" group 3.

The following standards have been considered for the production of our centrifuges:

- Accident prevention rules for centrifuges UVV-VBG 7z
- Accident prevention rules for electrical equipment & installations UVV-VBG 4
- DIN 58970, part 1,2 and 4 for centrifuges and centrifuge tubes
- Electrical interference suppression according to interference degree N as per VDE 0875

Manufacturer	BHG HERMLE GmbH & Co. Industriestrasse 8 - 12 7209 Gosheim/Fed. Rep. of Germany Tlx: 760613 bhgd, Fax: (07426)67 170
Type No.	Z 320
Dimensions: Width Depth Height	 390 mm 390 mm 340 mm
Weight	29 kg
Noise level	64 dB(A)
max. speed max. volume max.RCF Admiss. density Admiss. kinetic energy	10.000 rpm +/- 5% 400,0 ml 6.580 x g 1,2 kg/dm³ 2.400 Nm

Electrical requirements	115/220V, 50/60Hz	
Current	0,71 A	1,7 A
Connected load	0,155 KVA	0,195 KVA
Fuse	2.5 Amp, 5 x 20mm	

Interference suppression	interference degree N as per VDE 0875
Service Dept. at HERMLE:	074 26 / 67-438

For service or parts within the U.S.A., contact:

NATIONAL LABNET CO.
P.O. Box 841
Woodbridge, NJ 07095 USA
Phone: 201 283-4555 **Fax: 201 561-5634**

1.5 Accessories supplied with each centrifuge unit

- 2 spare fuses
- 2 plastic plugs
- 1 instruction manual
- 1 warranty certificate
- 1 spanner wrench for mounting and removing the rotor
- 1 hook for mechanical lid release

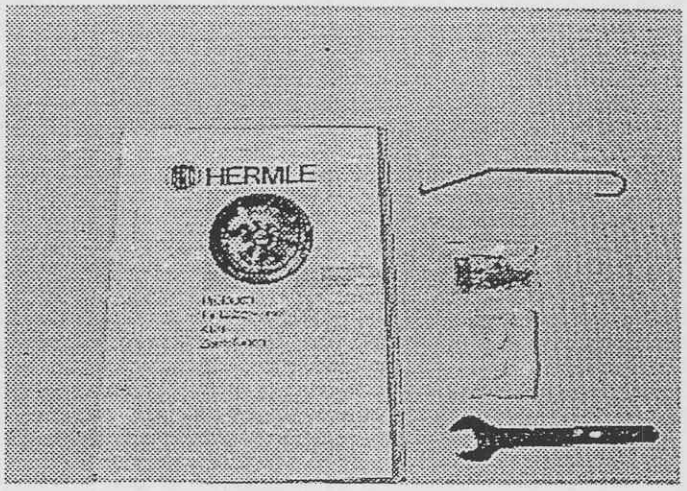


Figure 1

1.6 Warranty

The centrifuge has been subjected to thorough testing and quality control.

In the unlikely event of any manufacturing faults occuring, the centrifuge and rotors are covered by warranty for a period of 1 year from date of delivery.

This warranty becomes invalid in case of wrong operation, use of non-appropriate spare parts or accessories and non-authorized modification of rotor or centrifuge.

The manufacturer reserves the right for any technical modifications of the product in respect to technical improvement.

2. Installation

2.1 Unpacking the centrifuge

The centrifuge Z 320 is supplied in a carton protected by PU foam. Open the carton and take off the upper foam part (including the accessories) and remove the centrifuge.

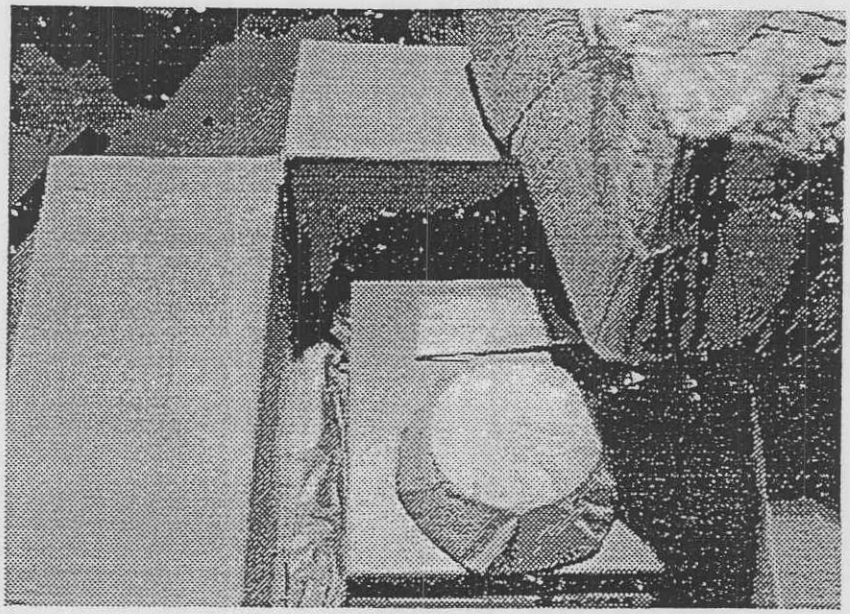


Figure 2

The instruction manual and the accessories mentioned under 1.5 should be kept with the centrifuge.

This unit is not designed for outdoor storage or outdoor use.

It must be stored in a cool dry place (between 5°C and 25°C).

2.2 Required space

The centrifuge should be installed on a rigid, even surface. The Z 320 should only be operated on a stable laboratory table/cabinet etc..

To guarantee sufficient ventilation, please ensure that the centrifuge has at least 15 cm free space around the unit.

It is recommended that the centrifuge is <u>not</u> sited in positions subject to excessive heat, e.g. strong sunlight, radiators etc. as heat-build-up can occur within the centrifuge bowl.

2.3 Installation

1. Before operating the centrifuge check that the power supply corresponds to that on the manufacturer's rating label which is mounted on the rear panel.

2. Switch on the power switch (1), the green control lamp of the power supply (1), as well as the white control lamp of the lid release (2) will light. The lid can then be opened by pressing firstly the lid release switch (2), as well as secondly the mechanical lid lock (3), (see figure 3).

FRONT VIEW OF CENTRIFUGE

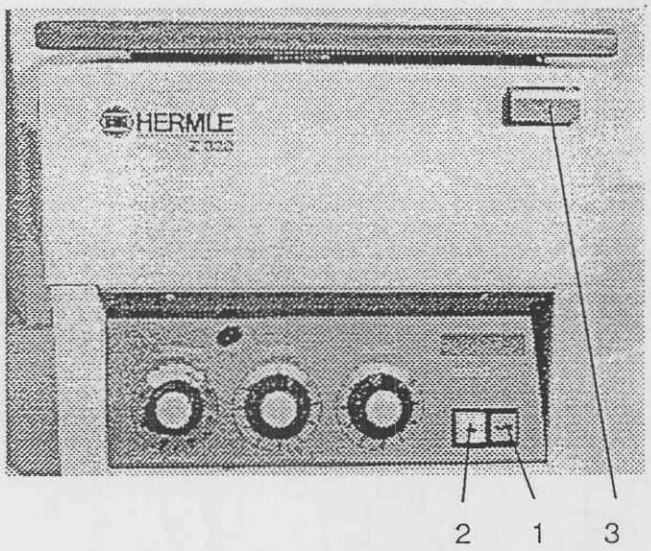


Figure 3

3. Remove the locking nut (1) on the motor shaft by turning clockwise and the transport protection out of the centrifuge bowl (2), (see figure 4).

TOP VIEW OF CHAMBER WITH TRANSPORT PROTECTION

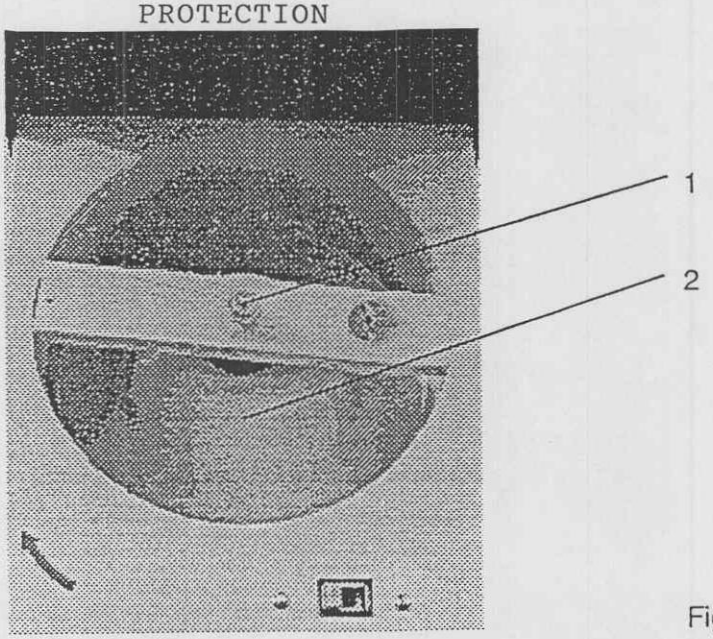


Figure 4

3. How to install and load a rotor

3.1 Mounting and securing a swing out rotor

Clean the motor shaft (3), as well as the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (4) align correctly with the rotor slots (1). Secure the rotor to the shaft by turning the rotor nut counter-clockwise (see figure 5 + 6).

BOTTOM OF TYPICAL ROTOR

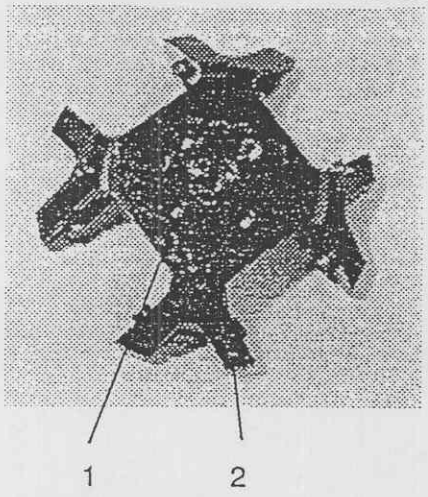


Figure 5

MOTOR SHAFT

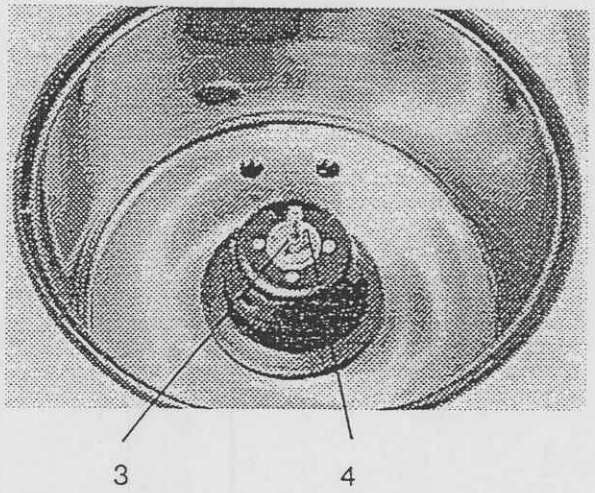
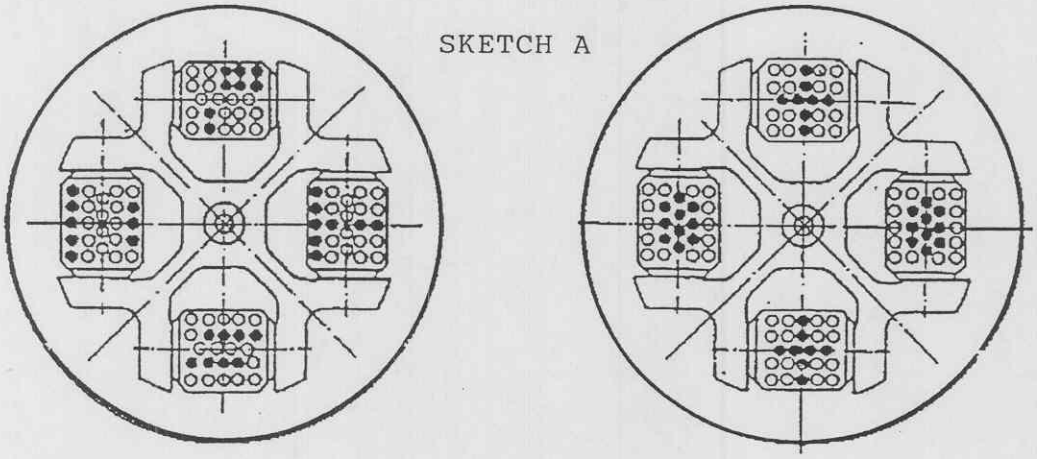


Figure 6

When loading the buckets, and tube racks, you should proceed according to the below sketch A.

ROTOR LOADING DIAGRAMS

SKETCH A



incorrect

correct

It is very important to load the rotor with the complete set of buckets / tube racks. Fill the tubes equally by eye-measuring and insert them into the tube-holes, respectively tube racks. The difference in weight between the loaded buckets / tube racks should not exceed 10 grams.

It is also allowed to operate, (for example) a 4-place swing out rotor with 2 loaded and 2 unloaded buckets, but it is important that the loaded buckets are then opposite each other (see sketch A, page 7).

To remove the rotor from the shaft turn the rotor nut clockwise repeatedly until the rotor nut has lifted the rotor from its former position on the motor shaft.

3.2 Mounting and securing a micro titre plate rotor

Is same as for swing out rotors.

3.3 Mounting and securing an angle rotor

Clean the motor shaft (1) and the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (3) align correctly with the rotor slots (4), (see figure 7).

BOTTOM ANGLE ROTOR AND TOP VIEW OF MOTOR SHAFT

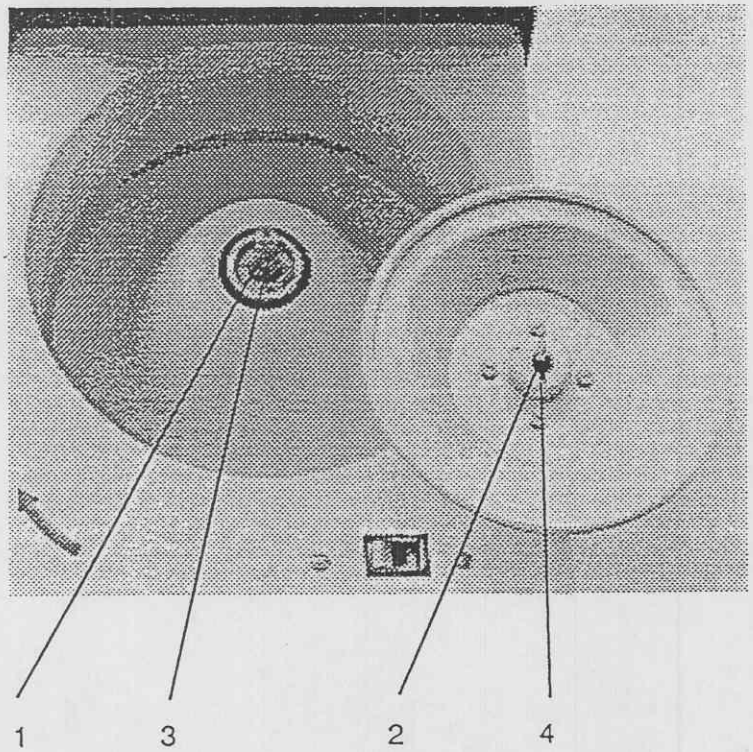


Figure 7

Secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. When doing this, hold the rotor with the other hand (see figure 8).

VIEW OF SECURING ANGLE ROTOR

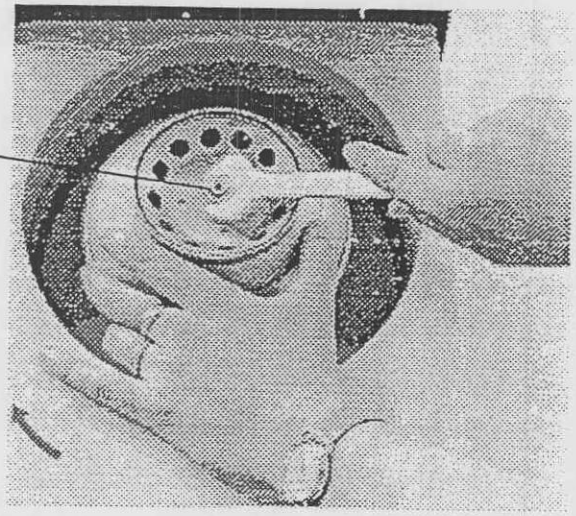


Figure 8

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector onto the rotor nut (see figure 9).

SECURING AN ANGLE ROTOR COVER

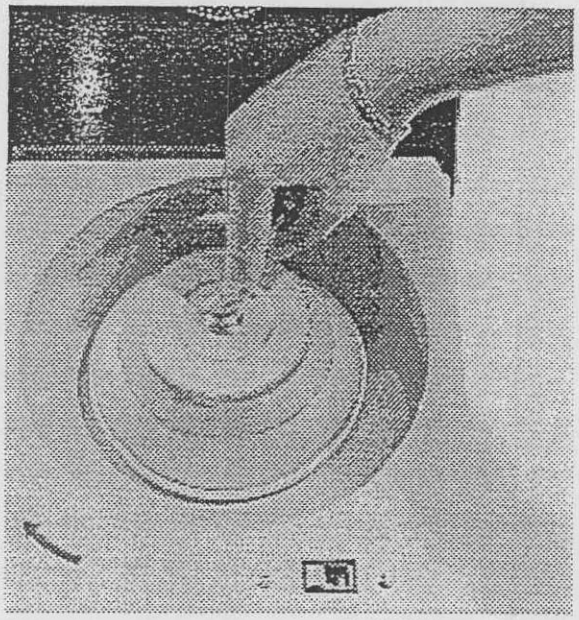


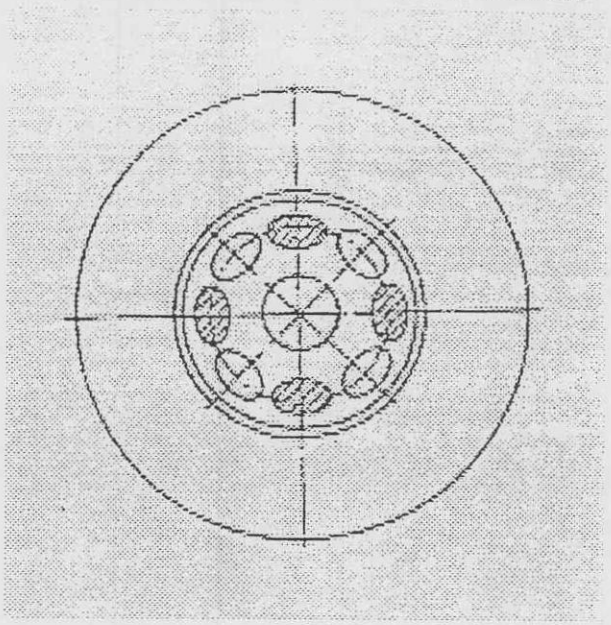
Figure 9

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

When loading the rotor you should proceed according to sketch B. Fill the tubes equally by eye-measuring and insert them into the tube-holes of the rotor (see sketch B).

The difference in weight between the tubes should not exceed 2 - 3 grams.

ANGLE ROTOR LOADING DIAGRAM



○ empty tube-holes

◌ loaded tube-holes

Sketch B

It is also allowed to operate, (for example) a 6-place rotor with 2 or 4 loaded tubes only, but it is important that the 2 occupied tube-holes are opposite each other (see sketch B).

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

3.4 Mounting and securing a hematocrit rotor

Clean the motor shaft (1) and the rotor mounting hole (2) with a piece of cloth and place the rotor on the motor shaft ensuring that the pins (3) align correctly with the rotor slots (4), (see figure 10).

BOTTOM VIEW OF HEMATOCRIT ROTOR AND MOTOR SHAFT

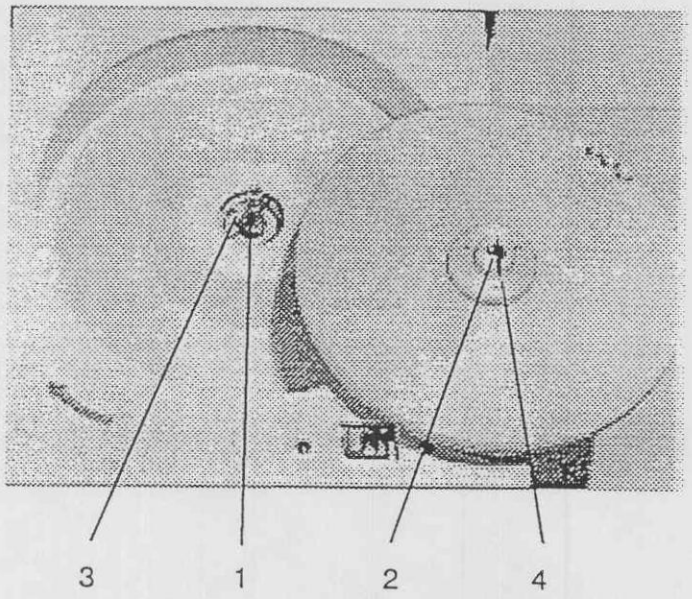


Figure 10

Secure the rotor to the shaft by turning the rotor nut (1) counter-clockwise. When doing this, hold the rotor with the other hand (see figure 11).

VIEW OF SECURING HEMATOCRIT ROTOR

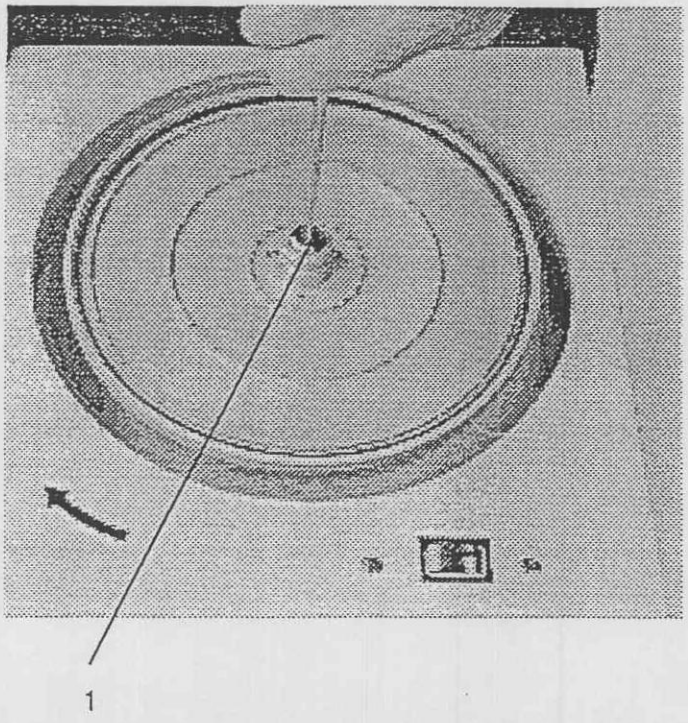


Figure 11

ATTENTION:

Before operation, secure the rotor lid to the rotor by pressing the snap connector onto the rotor nut (see figure 12).

INSTALLING HEMATOCRIT ROTOR COVER

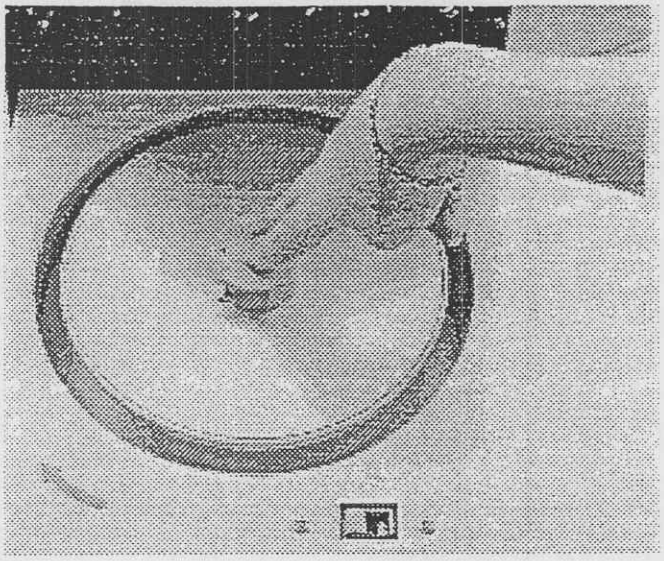


Figure 12

To install or remove the lid, press both locking bolts together (see figure 13).

To remove the rotor from the motor shaft, turn the rotor nut clockwise, screw it off and take the rotor vertically off the shaft.

REMOVING HEMATOCRIT ROTOR COVER

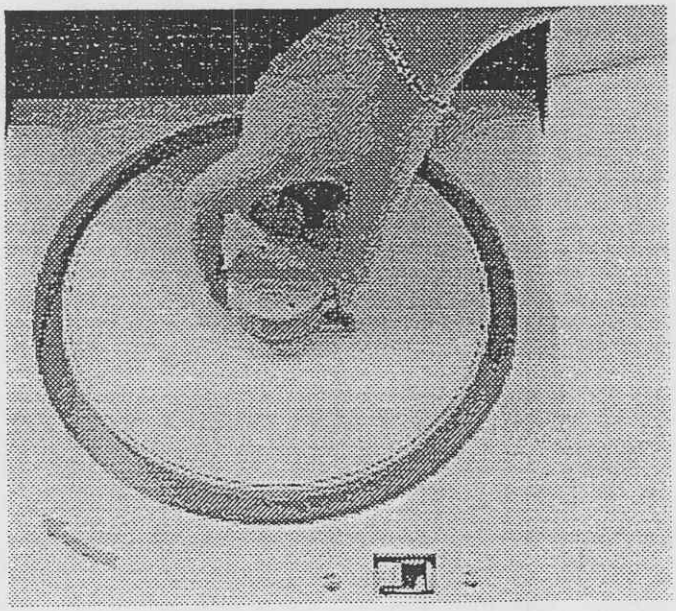


Figure 13

3.5 Overloading of rotors

The max. load permitted for a rotor, which is determined by the manufacturer, as well as the max. speed allowed with the rotor (see indications on the rotor itself) must not be exceeded.

The liquids with which the rotors are loaded should have an average homogeneous density of 1,2 g per ml or less, when the rotor is run at maximum speed.

To spin liquids of a higher density, the speed should be reduced according to the following formula:

$$\text{Reduced speed (n red.)} = \frac{1{,}2}{\text{higher density value}} \times \text{max. speed (n max.)}$$

Example: $n_{red} = \frac{1{,}2}{1{,}7} \times 4000 = 2.823 \text{ rpm}$

In case of any questions please contact the manufacturer!

ATTENTION:

Never operate the centrifuge with rotors or buckets which show any signs of corrosion or mechanical damage.

Never operate with strongly corrosive materials which could damage rotor and buckets.

4. Operation

4.1 Power switch

The power supply switch (1) (green light), switches the centrifuge on and the control lamp of the lid release (2), as well as the digital indication of the speed (3) will light. The power switch (1) should always be the first to be switched on and the last to be switched off, (see figure 14).

4.2 Lid release

When the lid release lamp (2) is on and the rotor is stationary, the lid can be opened. To open the lid, press the lid release switch (2) of the electrical lid lock, the indicator lamp (2) will go out,and then press the lid release button (4) of the mechanical lid lock.

The lid can **only** be opened when the rotor is stationary and the white control lamp (2) lights up (lid lock according to UVV-VBG 7z).

FRONT VIEW OF CENTRIFUGE

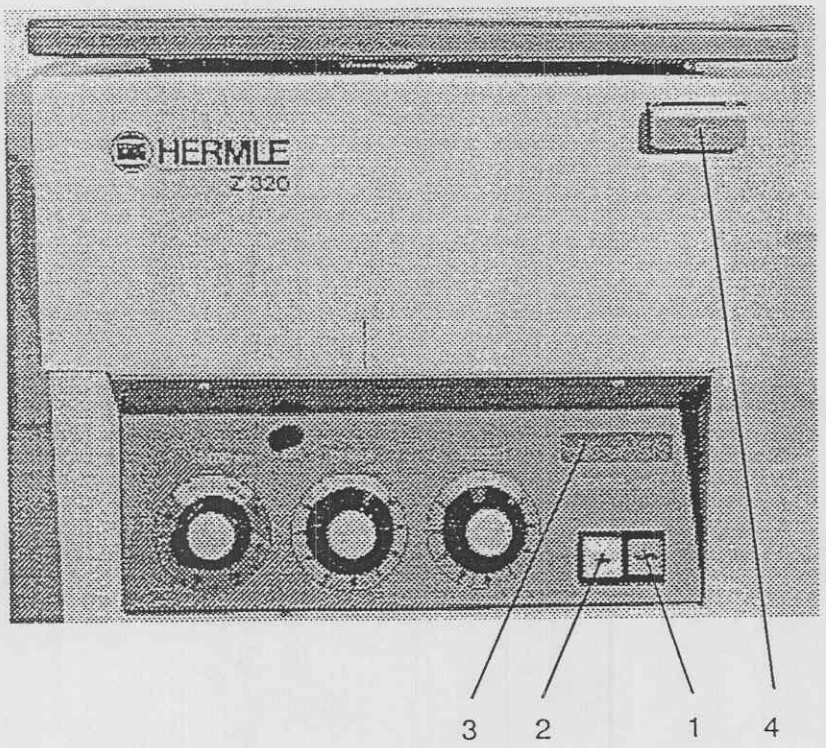


Figure 14

4.3 Rotor installation

see part 3. of the manual.

4.4 Lid lock

After correct fitting and loading of the rotor, close the lid. The white control lamp of the lid release (1) will light, indicating that the rotor is stationary and the lid closed correctly.
The centrifuge can only be started with the lid closed (lid lock according to UVV-VBG 7z).

When the rotor starts accelerating, the lid release indication (1) switches off and the lid cannot be opened, (see figure 15).

4.5 Speed preselection

The speed (rpm) can be steplessly preselected between 100 and 10.000 rpm (depending on the rotor type) with the knob SPEED (2).

Once set, the speed can be reproduced to within +/- 2%. The actual speed is indicated in steps of 100 rpm on the digital indication SPEED (3).

CONTROL PANEL - SPEED SELECTION

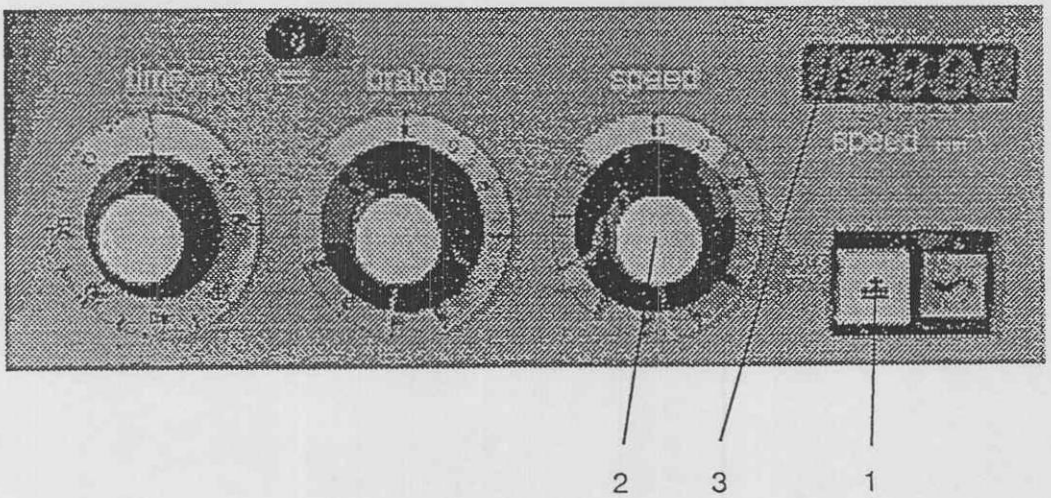


Figure 15

4.6 Preselection of operating time

Turning the timer switch (1) clockwise, sets the operating time (max. 60 mins.) and starts the centrifuge. If the required operation time is 5 minutes or less, the timer should be switched over the 30 minute position and then back to the desired value. When the set time expires, the centrifuge switches off automatically. For continuous operation, switch the knob TIME (1) to the position HOLD, (see figure 16).

4.7 Preselection of brake intensity

To reduce the risk of resuspending samples, during deceleration, it is possible to steplessly pre-select the brake intensity with the knob BRAKE (2), (see figure 16). In addition, please have a look at the acceleration and deceleration curves under point 8.1!

CONTROL PANEL

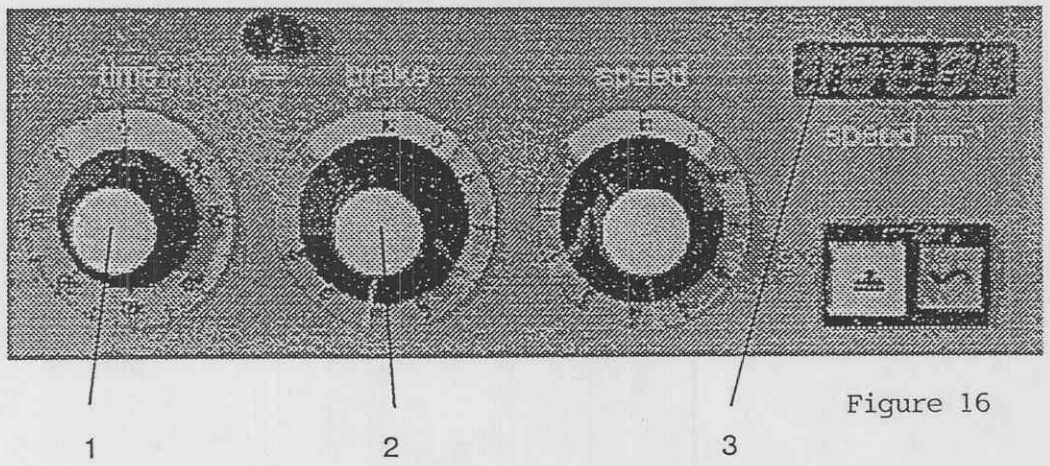


Figure 16

1 2 3

4.8 Stopping the centrifuge

When the preselected time has elapsed and the timer reaches the "0" position, the centrifuge will automatically start to decelerate and will soon come to a complete stop, at which time the lid release light will be illuminated, allowing the lid to be opened. The timer may be turned back to "0" at any time should there be a reason to discontinue operation.

5. Safety facilities

5.1 Imbalance

In case of unequal loading of opposite buckets / tube racks or tube-holes, the operation is interrupted during the acceleration phase, and the centrifuge switches off. To indicate, when the digital LED speed display blinks on and off, an imbalance cut off has occured.

The centrifuge cannot be re-started until the imbalance has been corrected and the lid has been opened and re-closed.

6. Service and Maintenance

6.1 Service of centrifuge

Centrifuge service and maintenance should be done regularly and only by authorized and qualified personnel.

6.2 Cleaning the centrifuge

Always keep the centrifuge housing, rotor chamber, rotors and rotor accessories clean. The bucket insert bolts of a swing out rotor should be regularly greased. Cleaning is not merely for hygenic or aesthic purposes, but also is necessary to prevent corrosion and damage to the centrifuge.

Anodized parts such as rotors, reduction plates etc., should only be cleaned with neutral cleaning agents (pH value 6 - 8). Never use an alkaline cleaning agent (pH > 8). After cleaning ensure that all parts are dried thoroughly by hand or in a warm-air-cabinet (max. temp. + 50°C).

It is recommended that all anodized aluminium parts are regularly treated with anti-corrosion oil, so that their durability will be increased and the corrosion risk reduced.

6.3 Cleaning of centrifuge after breakage of glass tubes/glass bottles

With high g-values, there is a possibility that tube breakage will occur.

Should this happen, the centrifuge rotor and rotor chamber must be thoroughly cleaned and all broken particles must be removed immediately. If this is not done, they could scratch the protecting coat of the rotor or stick to the bucket insert bolts and hinder the buckets to swing out properly.

If the rotor chamber has not been properly cleaned, this will produce a fine black dust which can cause significant damage to the centrifuge.

6.4 Disinfection

If, due to tube breakage, infectious material contaminates the centrifuge, rotor, rotor chamber, buckets etc. should be disinfected ! ! !

Rotor and swing-out buckets must not be autoclaved.

Rotor and rotor chamber should then be treated with a neutral disinfection agent. This would be the best way to achieve a good result upon all surfaces.

7. Breakdown

7.1 Emergency lid release

In case of power failure or any malfunction, the lid can be opened manually by the following procedure:

EMERGENCY LID OPENING PROCEDURE

1. Switch off the centrifuge and unplug the power cord.
2. Remove the plastic plug (1) on the left side of the housing.
3. Insert the lid release hook (2) (supplied with the centrifuge) into the hole and pull out the pin (3) by hooking the lid release hook into it before.
The lid can then be opened, (see figure 17 / sketch C).

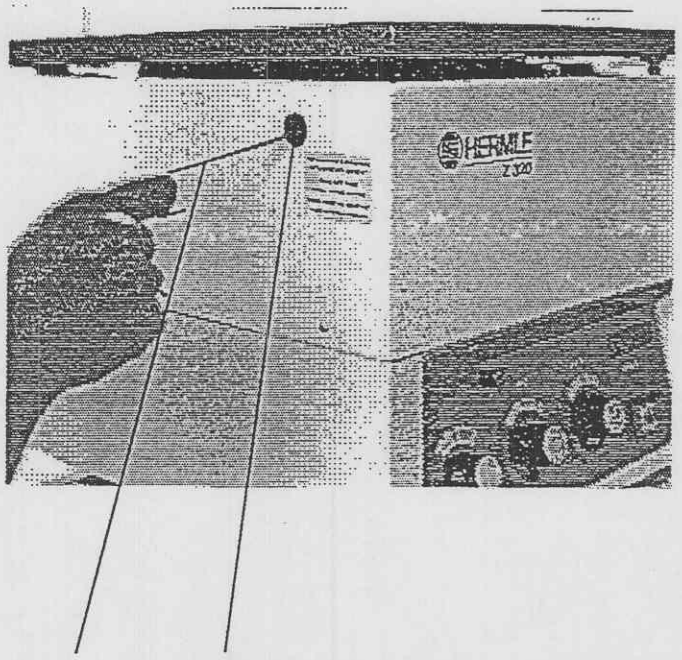
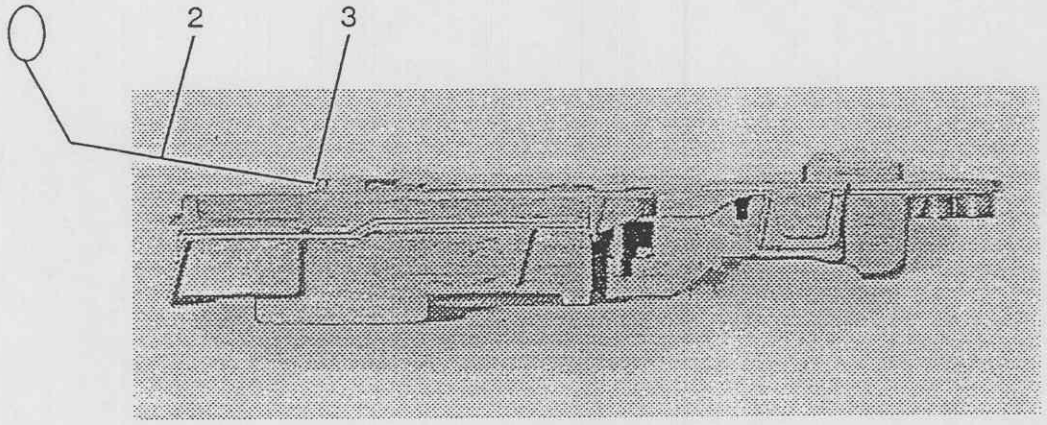


Figure 17

VIEW OF INNER LID LOCK MECHANISM



Sketch C

FAULT	POSSIBLE REASON	SOLUTION
Centrifuge will not start - no indication on front panel.	No power supply. Defective fuse.	Check mains (power) and centrifuge fuses. Replace if necessary.
**********	**********	**********
Lid cannot be released.	Defective lid lock.	Open manually (see 7.1)
	Lid lock is jammed.	Re-adjust lid lock.
	No power from PC board.	Call service.
**********	**********	**********
Centrifuge cannot be started, although power is on.	Lid not closed correctly (white indicator lamp does not light).	Close lid correctly.
	No speed or time preselected.	Check and set the time.
	Fuse on front panel is defecti-ve.	Check fuses and replace if necessary.

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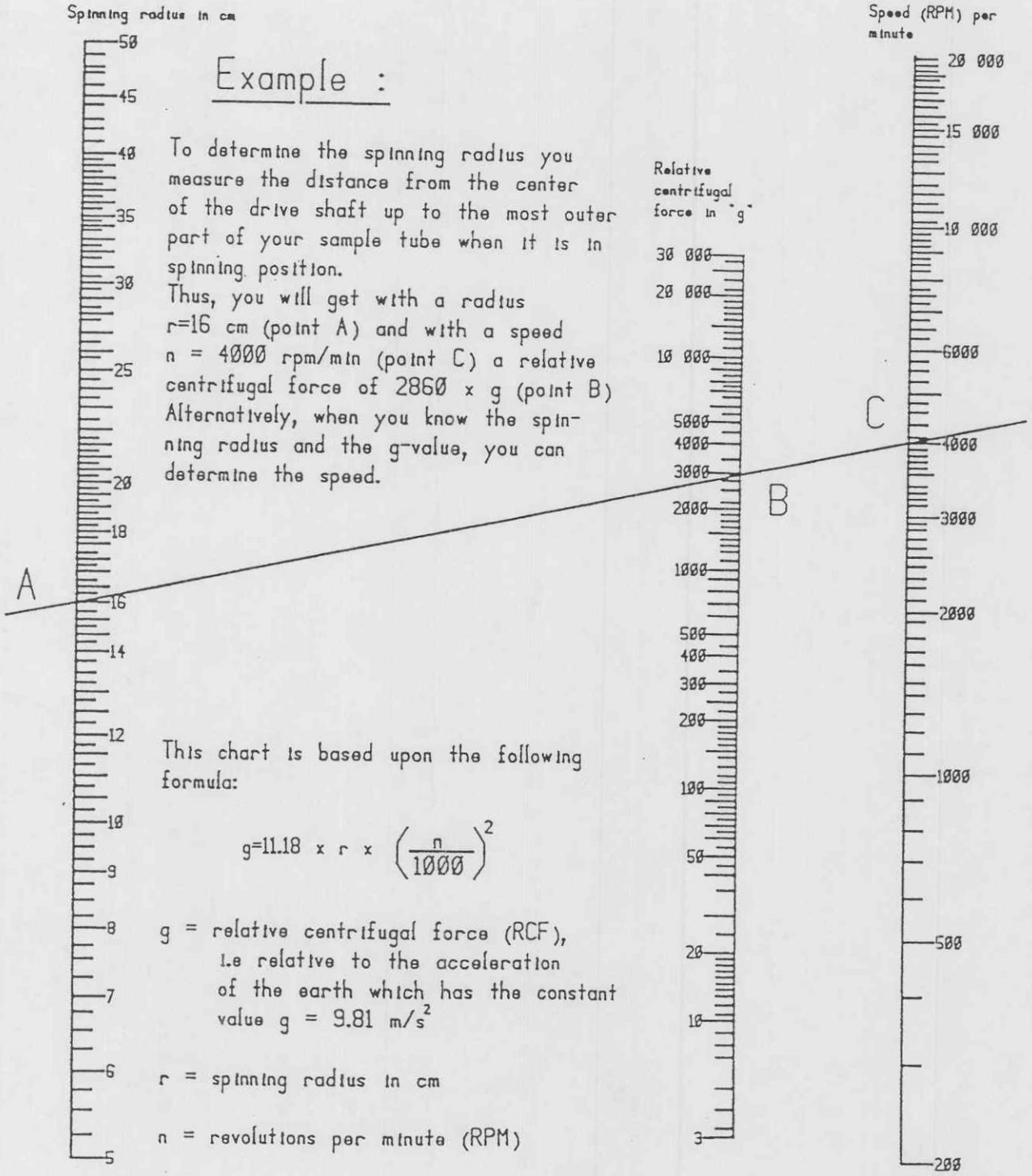
C H A R T

For the Determination of the g - Value



Example :

To determine the spinning radius you measure the distance from the center of the drive shaft up to the most outer part of your sample tube when it is in spinning position.
Thus, you will get with a radius r=16 cm (point A) and with a speed n = 4000 rpm/min (point C) a relative centrifugal force of 2860 x g (point B)
Alternatively, when you know the spinning radius and the g-value, you can determine the speed.

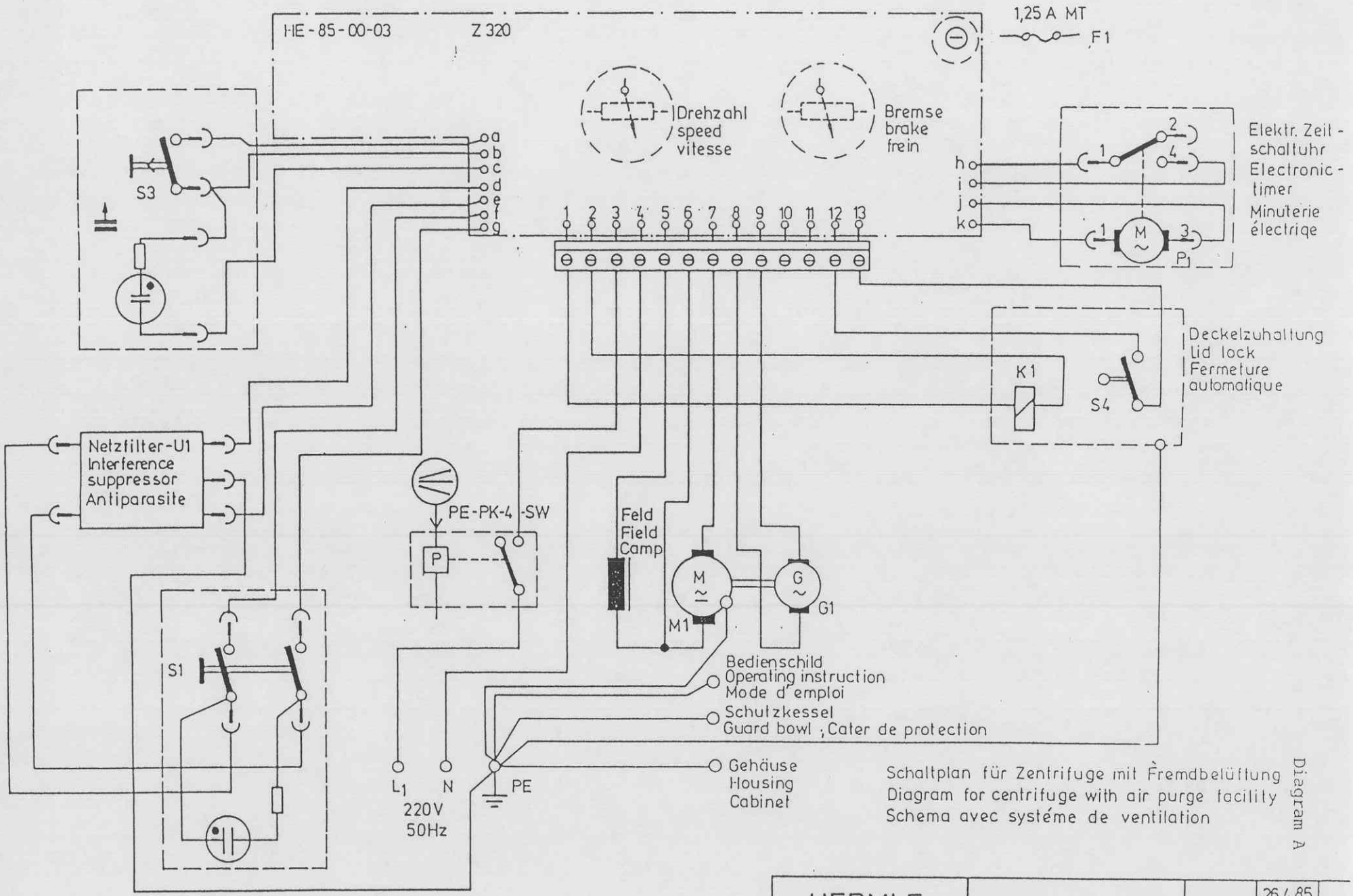
This chart is based upon the following formula:

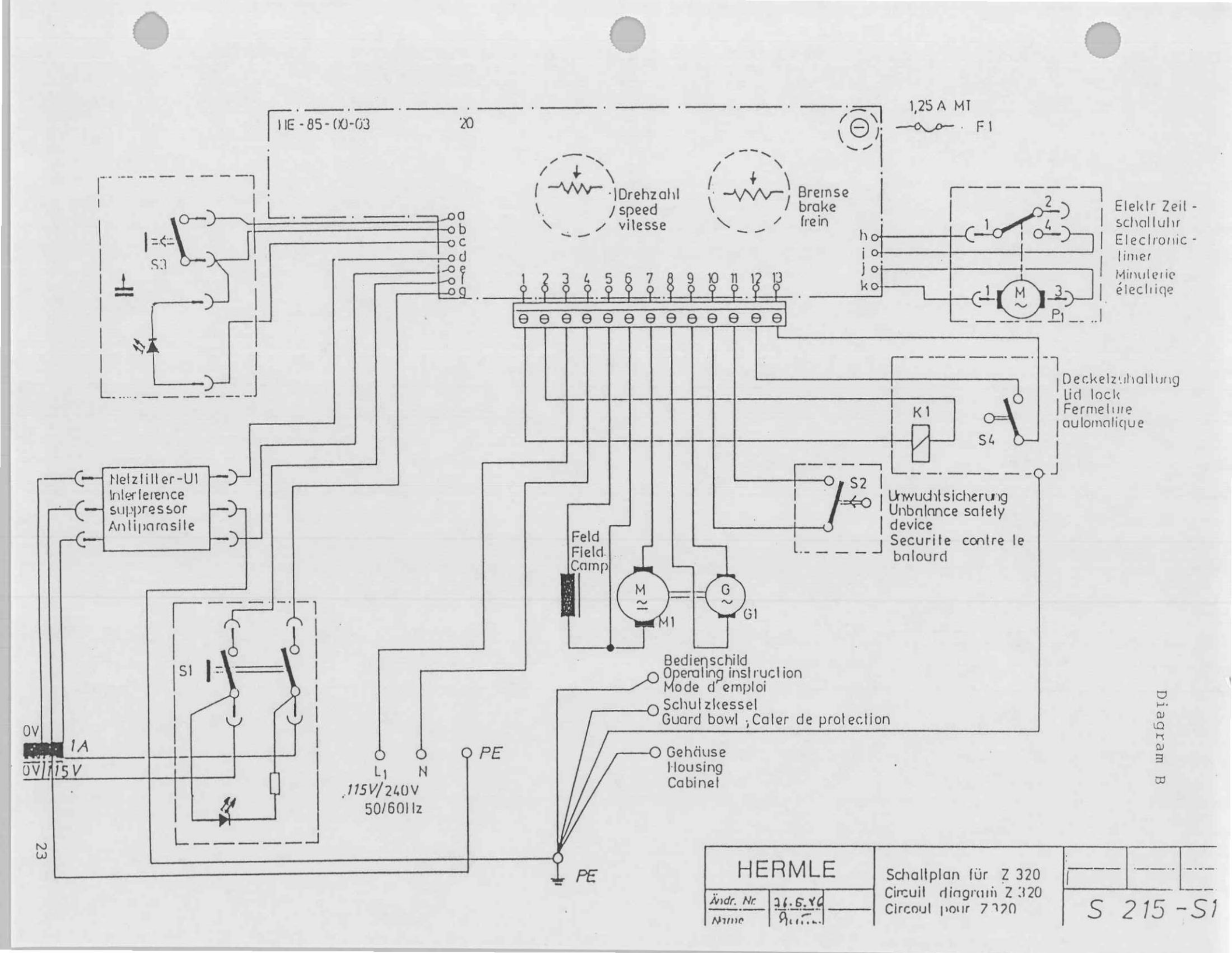
$$g = 11.18 \times r \times \left(\frac{n}{1000}\right)^2$$

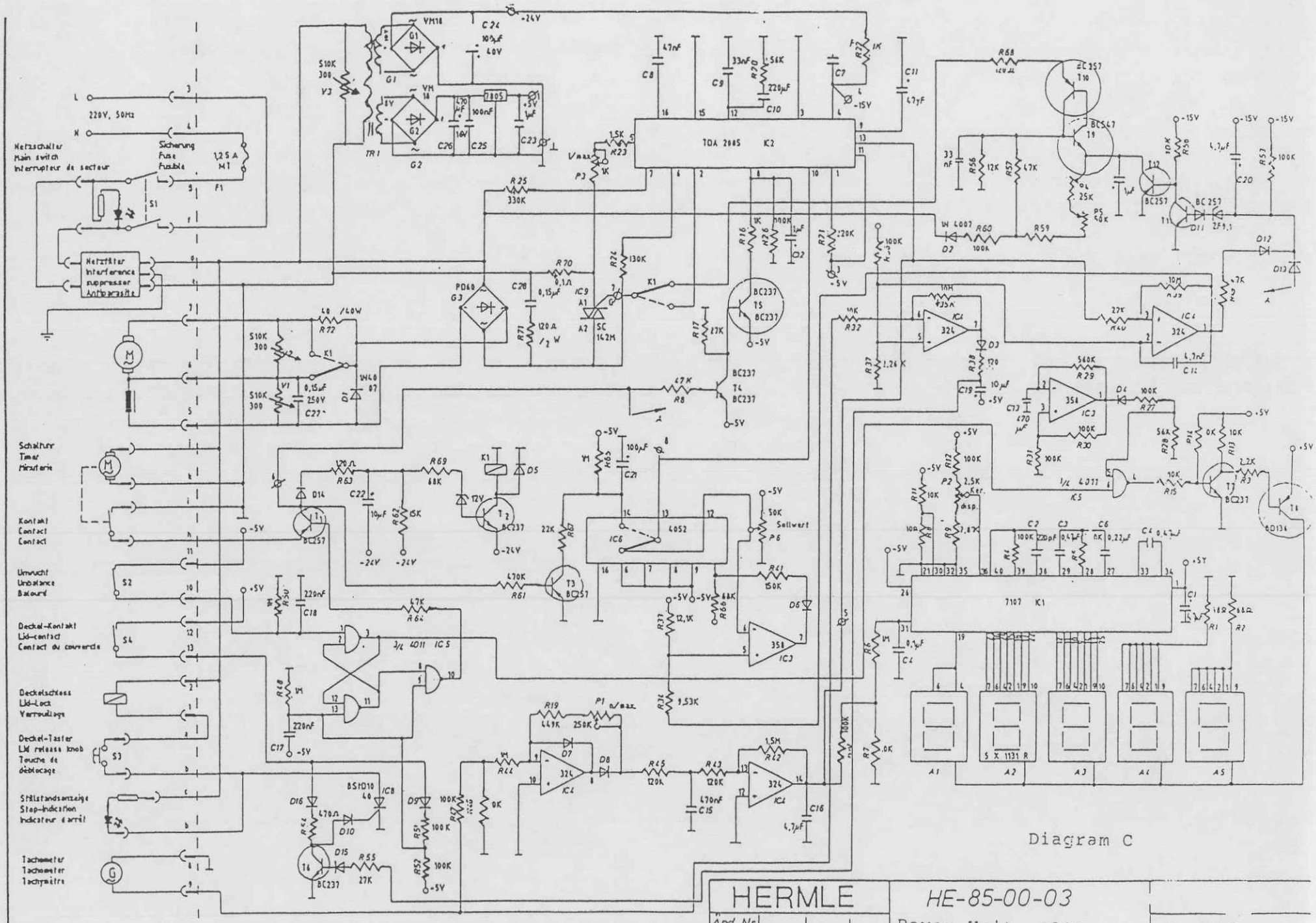
g = relative centrifugal force (RCF), i.e relative to the acceleration of the earth which has the constant value g = 9.81 m/s^2

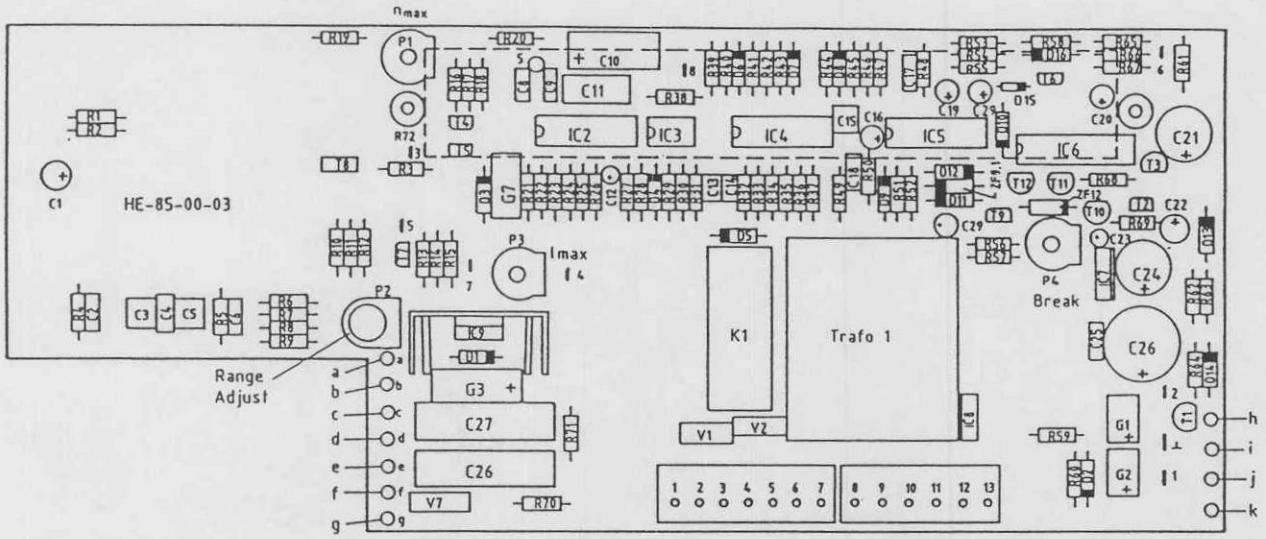
r = spinning radius in cm

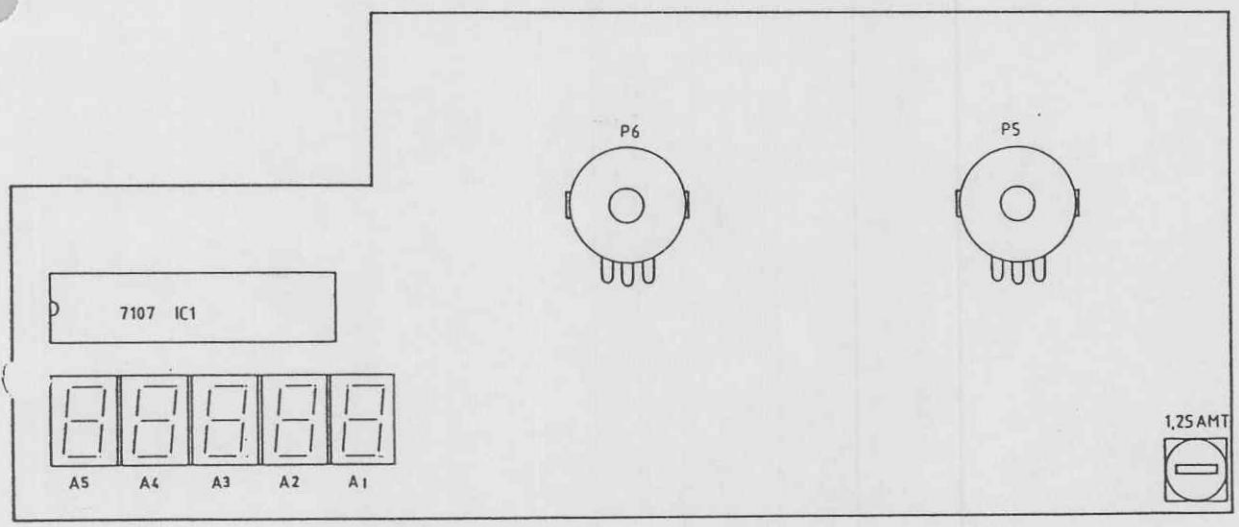
n = revolutions per minute (RPM)


HE-85-00-03 Z 320
1,25 A MT
F1
Drehzahl
speed
vitesse
Bremse
brake
frein
Elektr. Zeit-
schaltuhr
Electronic-
timer
Minuterie
électrique
S3
a
b
c
d
e
f
g
h
i
j
k
1 2 3 4 5 6 7 8 9 10 11 12 13
M
P1
Deckelzuhaltung
lid lock
Fermeture
automatique
K1
S4
Netzfilter-U1
Interference
suppressor
Antiparasite
PE-PK-4-SW
P
Feld
Field
Camp
M
G
G1
M1
S1
Bedienschild
Operating instruction
Mode d'emploi
Schutzkessel
Guard bowl ; Cater de protection
Gehäuse
Housing
Cabinet
L1
N
PE
220V
50Hz
Schaltplan für Zentrifuge mit Fremdbelüftung
Diagram for centrifuge with air purge facility
Schema avec système de ventilation
Diagram A
HERMLE
Name
Schaltplan für Z 320
Circuit diagram Z 320
Circout pour Z 320
26.4.85
S 242


1E-85-00-03
20
1,25 A MT
F1
Drehzahl
speed
vitesse
Bremse
brake
frein
Elektr Zeit-
schaltuhr
Electronic-
timer
Minuterie
électrique
S3
S4
K1
Deckelzuhaltung
Lid lock
Fermeture
automatique
S2
Unwuchtsicherung
Unbalance safety
device
Securite contre le
balourd
Netzfilter-U1
Interference
suppressor
Antiparasite
Feld
Field
Camp
M1
G1
S1
Bedienschild
Operating instruction
Mode d'emploi
Schutzkessel
Guard bowl ; Cater de protection
Gehäuse
Housing
Cabinet
L1
N
115V/240V
50/60Hz
PE
PE
0V
1A
0V 115V
23
Diagram B
HERMLE
Änder. Nr.
Name
Schaltplan für Z 320
Circuit diagram Z 320
Circuit pour Z 320
S 215 - S1


220V, 50Hz
Netzschalter
Main switch
Interrupteur de secteur
Sicherung
Fuse
Fusible
1,25 A
M1
F1
S1
Netzfilter
Interference suppressor
Antiparasite
TDA 2085 K2
7805
+5V
-5V
-15V
-24V
Schalter
Timer
Minuterie
Kontakt
Contact
Contact
Unwucht
Unbalance
Balourd
Deckel-Kontakt
Lid-contact
Contact du couvercle
Deckelschloss
Lid-Lock
Verrouillage
Deckel-Taster
Lid release knob
Touche de déblocage
Stillstandsanzeige
Stop-Indication
Indicateur d'arrêt
Tachometer
Tachometer
Tachymètre
7107 K1
4052
4011
324
358
BC237
BC257
BC547
Diagram C
HERMLE
HE-85-00-03
Power Unit Z320
S 236
And. Nr.
Name





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Board Layout for Z320

HE-85-00-03 Z320

Änd. Nr. | Datum 19.3.85 | Gez. Gepr. Shaw

S 230

ACCESSORIES FOR Z320 CENTRIFUGE

C-0320-2	C-0320-2	Rotor, 24 x 1.5 ml
C-0320-18	220.58 V02	Hematocrit rotor with reader
*C-0320-72	220.72 V01+	Rotor, complete with 4 buckets
*C-0320-72A	C-0320-72A	Same, but with screw cap for infectious containment
C-0320-720	220.72.70.04	Insert for 1 x 100ml tube
C-0320-728	220.72.78.04	Insert for 1 x 50ml (conical)
C-0320-725	220.72.75.04	Insert, 7 x 5ml (12 x 75, 10 x 75mm)
C-0320-724	220.72.74.04	Insert, for 4 each 16 x 100 or 17 x 100mm
C-0320-726	220.72.76.04	Insert, for 2 x 15ml tubes
C-0320-730	220.72.80.04	Insert, for 4 each 13 x 100mm tubes
C-0320-36	220.36 V01	Economy swing-out rotor
C-0320-365	220.36 V05	Carrier, 4 x 10-15 ml
C-0320-366	220.36 V06	Carrier, 7 x 3-5 ml
C-0320-367	C-0320-367	Carrier, 4 x 7 ml
C-0320-37	220.37 V01	Angle rotor 12 x 15ml, with shields
C-0320-38	C-0320-38	Angle rotor, 24 x 15ml, with shields
C-0320-50	220.5 V01	Rotor, with carriers for micro titration plates
C-0320-503	220.50.03	Spare micro plate carrier
C-0320-42	220.42 V01	Swing out rotor, 8 x 15ml
C-0320-73	4473	Angle rotor, 5,000 RPM,4 x 50ml

Table A